Iowa Power Fund Board Full Application Review October 8, 2008

Amana Farms Anaerobic Digester

- 2.8 mw digester
- project will use 20% on farm substrates, and 80% off farm substrates
- most material for digestion will come from Amana and businesses around the Cedar Rapids area
- Amana owns and operates 7000 crop acres and 6700 pasture acres
- Amana runs their own utility and could be an ideal location to prove technology
- The project seeks to develop renewable energy in a profitable way.
- The project will also seek to reduce odor, green house gases, and eliminate waste
- Genencor, Cedar River Paper, Sun Opta Ingredients, Swiss Valley Dairy, and Ox Yoke Restaurant will all feed the digester with waste streams
- The digester has been scaled up to a profitable size, 4 generators to make the plant profitable, which will allow 75% of the gas produced to be sold.
- Amana believes that the project will benefit all Iowans because:
    1. base load generation
    2. embedded generation
    3. displaces coal fired generation
    4. creates full scale research and education opportunities
    5. diverts waste away from public disposal
    6. can be duplicated at up to 3,600 livestock facilities in Iowa
- $164,575 of the project will go to educational aspects
- $918,000 of the project will go to digester scale-up
- Amana believes that the total project cost will roughly cost $5 million plus
- Amana is willing to share success of the project with the Power Fund.
- Over $300,000 in cost saving is being passed on to Amana Utility customers, Whirlpool Amana is a major customer, and offering low cost energy is important for the industry in the area.

Board Comments and Questions

- The research and educational components of the project are important for the Power Fund.

Q. How is the waste output managed by Amana?
A. It is agricultural waste, which is managed by the Amana's manure management plan.
Q. At what cost will the digester be replicable for feedlots across the state?
A. The project is roughly scale-able. Smaller digesters would cost less, about 1/5th of the Amana project. Amana also invested in some higher quality items which increased cost.
Q. On the 7-8 year payback, is a carbon credit assumption included?
A. Yes, but some work will be needed.
Q. Does Amana feel this project will be profitable with the grant, or does there need to be work done that equates what off farm substrates need to be evaluated to be used in the digester?
A. Amana has begun some of the work. Sometimes bacteria of off farm substrates need to be

concocted in slightly variable ways. Amana is happy to share the results of research so the project data could be useful for other projects in the state.
Q. Are there colleges that teach information about digesters? Is this an opportunity to make sure that people in the state become educated about the technology?
A. Yes is the cattle industry, in civic engineering; there are several areas that could incorporate this industry into this technology.
Q. How will this project work from a research perspective?
A. The feedstock stream would be altered to measure the quality of digestion, the amount of time that feedstock takes to digest, the cleanliness of the methane gas, the quality of the methane gas.
Q. Under optimum conditions it looks like the digester has high production?
A. Yes at peak projection the digester will produce 2.8mw, and 2.1mw off of non-peak production.
Q. What will the cost be per kWh?
A. Yes about $0.035 cents per KWH. But, the applicant is looking at ways to reduce cost.
Q. How many operations could be developed in the state?
A. There probably won't be 3600, but there could be 30-40.

- The research impacts of this proposal are significant, the fertilizer outputs as well as the inputs have tremendous research potential.

Q. What are the outputs that could be considered feedstock from biofuels producers?
A. With high grain prices many grain by-products may not be the best input, but as the market fluctuates, grain by-products could be viable in the future. Amana has signed a five year contract in order to assure supply.
Q. Will any microbe evaluation be done?
A. Right now the cow manure will act as the microbe, but in the future there could be research on this area.

- There would be some concern from the DNR on genetically modified microbes that would be used in the process. The DNR would suggest natural occurring organisms not genetically modified.
- The project cost has been lowered from $1,158,000 to $1,082,575.

Q. How much will be dedicated to research?
A. About $165,000 to education. The Amana Farms will not do these educational aspects without Power Fund dollars.

- Investment in the Power Fund should be to give people from across the state access to the digester for research and educational opportunities (Leopold)

- The project appears to cash-flow regardless of the Power Fund's investments. Does this much money need to go into the project, would like to see the Power Fund invest enough to open the project up so the technology takes off all over Iowa?

Passed -
Applicant was asked to think about how much R&D and how much R&D would go into the project.